1350.0 - Australian Economic Indicators, 1992
ARCHIVED ISSUE Released at 11:30 AM (CANBERRA TIME) 20/07/1992

1992 Feature Article - Environment Statistics: Frameworks and Developments
This article was published in Australian Economic Indicators June 1992 issue on 1 June 1992.

Introduction

The increasing emphasis on setting environmental policies and the associated demand for coherent information on the environment has led the Australian Bureau of Statistics (ABS) to take an increasing interest in this field.

The ABS is investigating the compilation of balance sheet accounts relating to forestry, land and sub-soil assets as the initial stage of a program of compiling national and sectoral balance sheets for inclusion in the national accounts. The ABS is also contributing to the international debate on the incorporation of natural resource and environmental concerns into national flow accounts. An article discussing the various approaches to this was published in the March Quarter 1990 issue of Australian National Accounts: National Income and Expenditure (cat. no. 5206.0). The ABS has rejected proposals for altering the core of the national accounts to produce a measure of so called "green GDP" and supports the development of satellite accounts consistent with the guidelines being developed by the United Nations Statistical Office (UNSO) as part of its review of the System of National Accounts (SNA).

The ABS is also:

- collating existing Australian environmental statistics;

- collecting information from households on environmental behaviour and attitudes; and

- collecting data on environmental protection expenditure, pollution abatement and other environmentally related activities by including questions in several existing industry and activity specific ABS surveys and censuses.

A major step in the first activity has been achieved with the recent release of a compendium of Australian environmental statistics "Australia's Environment: Issues and Facts (cat. no. 4140.0)". The remainder of this article describes the basic framework used in the compendium publication to present the statistics and explores possible future developments.

The compilation used the Framework for the Development of Environment Statistics published by the UNSO in 1984. In undertaking the compilation, the ABS made a number of departures from this framework. These are described in the publication, together with the reasons for the modifications.

The UNSO Framework

The UNSO framework helps to define the scope, boundaries and dimensions of the field referred to loosely as "environment statistics". In deriving it, consideration was given to four possible

approaches to the organisation of the elements of environment statistics. These are described briefly in the following paragraphs.

The **media** approach organises data on air, water, land/soil and the human environment to depict the **state** of the natural environment. In this way, there is an analysis of the environment at defined points rather than a focus on continuous assessment of environmental change. This approach tends to de-emphasise "human-natural environment" interactions.

The **stress-response** approach was instigated by Statistics Canada as a means of developing a framework related to processes of environmental change. It focuses on the stresses placed on the environment as a result of human activity and the reactions of the environment to these as depicted in a series of indicators. With this approach, statistics are organised under the categories: stressors, stresses, collective and individual responses, and stocks.

The **resource accounting** approach traces the flow of natural resources from their extraction (harvest) from the environment, through successive stages of processing and final use, to their return to the environment as waste or to the economic sector for recycling.

The **ecological** approach looks at a variety of relationships between plants and animals and their environment. Within this, it deals with such aspects as ecological diversity, dynamics, biomass production, and the productivity of ecosystems.

The UNSO framework has combined the media approach with stresses and responses from the stress-response model. With such a combination, there is the ability to analyse and disseminate data from a wide range of topics and to relate these to changes in the environment.

Figure 1 shows the structure of the framework. Whilst the components of the environment (the rows) indicate the scope of the statistics, and the information categories (the columns) classify the interactions between sectors of the environment, the information within the table itself is not rigid. The framework has the flexibility to be expanded and modified as agencies see fit and can be used to incorporate new information as it comes to hand. Information may be placed in several different categories depending on the focus of the information collected.

FIGURE 1. STRUCTURE OF THE FRAMEWORK

Components of the environment	Information categories			
	Social and economic activities and natural events	Environmental impacts of activities and events	Responses to environmental impacts	Inventories, stocks and background conditions
1. Flora				
2. Fauna				
3. Atmosphere				
4. Water				
(a) Freshwater				
(b)Marine water				
5. Land/soil				
(a) Surface				
(b) Sub-surface				
6. Human settlements				

Source: UNSO, 1984.

The natural environment includes the media of air, water and land/soil, as well as the biota found in each. The man-made environment is represented by human settlements which consist of physically created elements, namely, shelter, infrastructure and services.

The information categories of the framework were developed to "reflect a sequence of action, impact and reaction". Relevant information refers to social and economic activities and natural events, their impacts on the environment, and the responses to these impacts by governments, non-governmental organisations, businesses and individuals. The categories may suggest cause and effect relationships. While there may be an obvious degree of causal association, one-to-one relationships are not established and should not be inferred, as environmental impacts and responses may be caused by a number of activities.

Social and economic activities and natural events are those activities which create impacts on the environment. They include such factors as agricultural activities, chemical emissions, mining activities, floods and droughts. Relevant activities can be described in a variety of ways and at various levels of detail.

Impacts are indicated under **environmental impacts of activities and events** and are usually shown associated with the component affected. Within the Australian context these impacts can result in species of flora and fauna becoming endangered, salinity and soil degradation, air and water quality problems, and the like.

Responses to environmental impacts include activities by governments, businesses and interest groups to prevent, control, counter or avoid negative impacts and to generate, promote or reinforce positive ones. Some examples are the development of national, State and regional parks and conservation areas, reafforestation, air and water quality standards and regional planning.

The category **inventories, stocks and background conditions**, contains topics intended to bring into perspective information in the other three categories. It covers the stocks of natural resources as well as economic, demographic or geographical background conditions. A direct link "between the stock data presented in this information category and the interaction or impact data of the other information categories can be established by means of balance sheets or resource accounting. For other topics, namely, production and consumption patterns, price/cost structures, and changes and trends in urbanisation and industrialisation, these links are not so obvious. These topics shed light on the settings within which specific activities and their impacts take place." (UNSO,1984)

Several activities are not adequately covered by the UNSO framework. For example, it does not address the important issue of presenting changes made by people in response to environmental changes. Thus, it does not address changes in agriculture due to the encroachment of salt onto farmland. Nor does it provide the means to analyse or discuss the association between economics and the population of an area - two factors vital to the study of environmental impacts.

Current and Possible Future Developments

Since the UNSO framework was developed in 1984, there has been greater interest at the international level in linking the environment and the economy so that decision-makers can be provided with information that incorporates environmental impacts into economic decision processes.

The System of National Accounts (SNA) is a well-known means for integrating economic stocks and flows. This system is founded on a widely accepted theoretical model, and all parts and variables are connected through accounting identities. Money is the common unit of measure and the concepts, definitions and classifications of the system are generally accepted.

Since the publication of the UNSO framework, considerable attention has been given to the possibility of revising the SNA to account for environmental degradation and use of natural resources. The involvement of the ABS in this and the support of the ABS for additional satellite accounts has been outlined at the beginning of this article. The emphasis on the economy-environment linkage is being further explored in a number of countries by expanding their natural resource accounts, national balance sheets and various models to describe environmental impacts.

In the field of environment statistics, there is no generally accepted theoretical base or common unit of measure. The UNSO framework does not contain descriptions of statistical concepts, definitions, classifications and tabulations, as does the SNA. This deficiency has been addressed in part by two UNSO technical reports on specific issues which contain descriptions of variables and classifications.

The ABS will continue to investigate other statistical frameworks for presenting environment statistics. Several overseas developments are of interest in this regard. The OECD has produced a set of environmental indicators as a way of assessing the relationship between human activity and the environment. Some of these indicators are presented in Table 1. In Statistics Canada, a new approach called the Population Environment Process model has been used as the basis for their most recent statistical compendium. This systems-based model relates stocks (such as natural assets and population) with various processes such as socio-economic processes, and shows flows between these, such as the flow of goods and services from a socio-economic process to the population.

TABLE 1. OECD ENVIRONMENTAL INDICATORS, 1991

Indicator	Ref. period	Canada	USA	Japan	Australia	Netherlands	Sweden	UK	Total OECD	Total world
Carbon dioxide (C02) emissions from energy use (million tonnes of carbon)	1988	124	1,433	272	**71**	51	21	163	2,793	6,256
Change from 1971 (%)		31.9	18.5	25.4	**47.9**	15.9	-22.2	-12.8	15.1	42.8
Per unit of GDP (kg/ $US'000)	1988	316	324	181	**404**	380	194	317	286	635
Per capita (tonnes)	1988	4.8	5.8	2.2	**4.3**	3.4	2.5	2.9	3.4	1.2
Greenhouse gas emissions (million tonnes of carbon)	Late 1980s									
CO2		126	1,443	281	**72**	51	21	166	2,840	6,400
Methane		79	692	26	**90**	26	5	75	1,290	5,100
CFC		34	332	95	**20**	17	6	67	901	1,300
Total		239	2,468	402	**182**	94	32	307	5,030	12,800
Per unit of GDP (kg/ $US'000)		608	558	268	**1,035**	705	295	599	516	662
Per capita (tonnes)		9.2	10.0	3.3	**11.0**	6.4	3.8	5.4	6.1	2.5

Protected areas ('000 sq. km)	1989	718.6	790.4	240.0	**364.8**	1.5	17.1	25.7	2,180.5	5,290.8
Change from 1970 (%)		384.9	237.1	21.8	**235.9**	66.7	242.0	97.7	271.9	231.1
Per cent of land area	1989	7.8	8.6	6.4	**4.8**	4.4	4.2	10.6	7.1	4.0
Use of nitrogen fertilisers applied to arable land (tonnes/ sq.km)	1988	2.6	5.1	13.7	**0.8**	46.7	7.6	20.9	5.7	5.4
Change from 1970 (%)		271.4	30.8	9.6	**100.0**	1.3	2.7	68.6	46.2	145.5
Threatened species (per cent of species known)	Late 1980s									
Mammals		7.3	10.5	7.4	**13.4**	48.3	15.4	31.2	na	na
Birds		3.8	7.2	8.1	**3.3**	33.1	6.8	15.0	na	na
Fish		1.2	2.4	10.6	**na**	22.4	4.6	3.4	na	na
Reptiles		2.4	7.1	3.5	**1.6**	85.7	0.0	45.5	na	na
Amphibian		2.4	3.6	6.3	**4.0**	66.7	38.5	33.5	na	na
Vascular plants		0.8	0.5	10.2	**12.3**	na	8.2	9.6	na	na
Waste generation	Late1980s									
Municipal waste Total ('000 tonnes)		16,400	208,000	48,300	**10,000**	6,900	2,650	17,700	420,000	na
Per capita (kg)		632	864	394	**681**	467	317	353	513	na
Per capita (kg) Industrial waste Total ('000 tonnes)		61,000	760,000	312,300	**20,000**	6,690	4,000	50,000	1,430,000	na
Per unit GDP (tonnes/$US mill)		155	186	235	**146**	50	37	97	146	na
Hazardous ('000 tonnes)		3,300	275,000	na	**300**	1,500	500	4,500	313,000	na
Growth of economic activity GDP at 1985 prices and exchange rates (Index 1970=100)	1989	208	173	226	**187**	154	146	155	177	na
Change from 1975 (%)		61.2	54.5	82.3	**54.6**	31.6	28.1	40.9	53.9	na
GDP ($US billion)	1989	401	4,544	1,573	**184**	138	111	530	10,070	na
Per capita ($US '000)	1989	15.5	18.4	12.8	**11.1**	9.4	13.1	9.3	12.2	na

	Year									
Private final consumption expenditure at 1985 prices and exchange rates (Index 1970=100)	1989	217	180	217	**187**	157	136	173	182	na
Change from 1975 (%)		59.5	55.2	65.7	**50.8**	31.9	20.4	206.2	51.7	na
Total ($US '000 million)	1989	235	2,944	906	**107**	83	59	346	6,254	na
Per capita ($US '000)	1989	9.0	12.0	7.4	**6.5**	5.6	7.0	6.1	7.6	na
Energy intensity										
Total primary energy requirements/ unit GDP (TOE) per $US '000)	1988	0.64	0.44	0.27	**0.47**	0.48	0.52	0.41	0.41	na
Change from 1970 (%)		-0.2	-26.7	-29.0	**-13.0**	-12.7	-10.3	-32.8	-24.1	na
Energy requirements (TOE) per capita	1988	9.6	7.8	3.3	**5.0**	4.4	6.7	3.7	4.8	na
Total TOE (mill tonnes)	1988	249.5	1,928.4	398.8	**82.7**	64.5	56.2	208.5	4,002.9	na
Transport trends										
Road traffic 10^9 veh.km	1989	225	3,307	521	**153**	89	61	357	6,343	na
Change from 1970 (%)		78.6	85.1	130.5	**93.7**	85.4	74.3	99.4	92.9	na
Motorways (km)	1989	7,450	83,960	4,410	**1,100**	2,070	1,000	2,990	133,300	na
Change from 1970 (%)		169.9	56.4	530.1	**6.8**	111.2	150.0	182.1	83.1	na
Passenger vehicles in use ('000 vehicles)	1989	12,142	143,708	32,621	**7,578**	5,371	3,578	21,583	339,830	424,456
Change from 1970 (%)		83.9	61.0	271.6	**97.6**	117.9	56.4	82.9	96.2	119.3
Population ('000 inhabitants)	1990	26,603	251,523	123,540	**17,085**	14,951	8,559	57,411	836,780	5,292,000
Change from 1970 (%)		24.9	22.7	19.1	**36.6**	14.7	6.4	3.2	17.3	43.3
Population density (inhabitants/ sq. km)	1990	2.7	26.8	327.0	**2.2**	366.4	19.0	234.5	26.0	39.0

This feature article was contributed by Jeannette Heycox, ABS.

References

UNSO (1984) United Nations Statistical Office, Statistical Papers M78, A Framework for the Development of Environment Statistics.

OECD (1991) Environmental Indicators 1991